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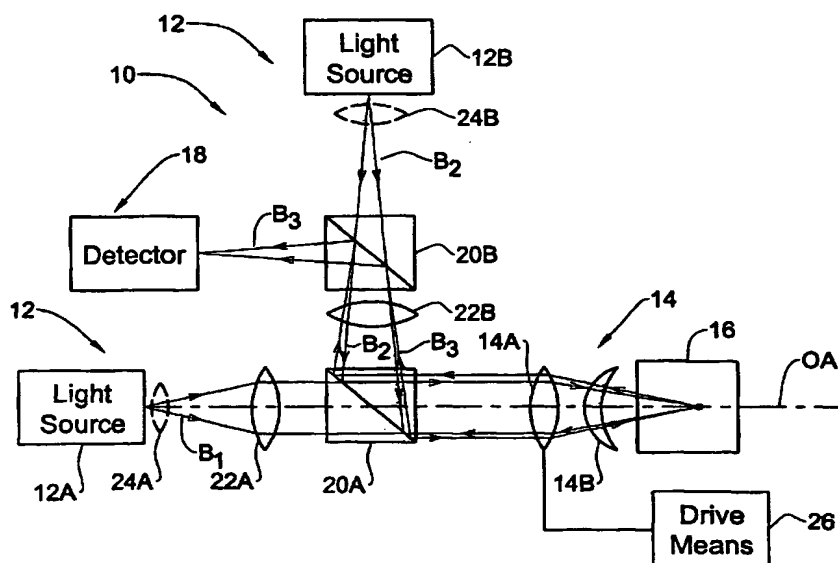
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(54) Title: TIGHT FOCUSING METHOD AND SYSTEM



(57) Abstract: A method and system are presented for use in recording/reading data from an array of data units within a three-dimensional storage medium. Exciting radiation is provided in the form of first and second light beams of first and second different wavelengths, respectively. The first and second light beams are concurrently directed and focusing onto desirably distanced from each other sites in the medium and excited light of a third wavelength coming from the excited site is collected to form an excited light beam to be directed towards a detector assembly, while correcting for chromatic and spherical aberrations of the light focusing and collection. This focusing/collection is sequentially repeated for successive sites in the medium with varying depth of focus.

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**A. CLASSIFICATION OF SUBJECT MATTER**  
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## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 291 132 B1 (LEVICH EUGENE BORIS ET AL) 18 September 2001 (2001-09-18) column 10, line 20 - column 19, line 50; figures	1-3, 15, 28-31, 49
X	WO 00/31733 A (PAVEL EUGEN) 2 June 2000 (2000-06-02) page 22, line 1 - page 32, line 16; figures	1, 31
A	US 6 432 610 B1 (DVORNIKOV ALEXANDER ET AL) 13 August 2002 (2002-08-13) column 12, line 12 - column 22, line 55; figures	1-49
A	US 5 325 324 A (RENTZEPIS PETER M ET AL) 28 June 1994 (1994-06-28) column 12, line 57 - column 26, line 49; figures	1-49

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US 6291132	B1	18-09-2001	US 6071671 A	06-06-2000
			AU 5358398 A	29-06-1998
			EP 0943144 A1	22-09-1999
			JP 2001524245 T	27-11-2001
			WO 9825268 A1	11-06-1998
WO 0031733	A	02-06-2000	WO 0031733 A1	02-06-2000
			AU 1579799 A	13-06-2000
			CA 2318845 A1	02-06-2000
US 6432610	B1	13-08-2002	NONE	
US 5325324	A	28-06-1994	US 5268862 A	07-12-1993
			US 6608774 B1	19-08-2003
			US 6483735 B1	19-11-2002

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information on patent family members

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6291132	B1	18-09-2001	US 6071671 A AU 5358398 A EP 0943144 A1 JP 2001524245 T WO 9825268 A1	06-06-2000 29-06-1998 22-09-1999 27-11-2001 11-06-1998
WO 0031733	A	02-06-2000	WO 0031733 A1 AU 1579799 A CA 2318845 A1	02-06-2000 13-06-2000 02-06-2000
US 6432610	B1	13-08-2002	NONE	
US 5325324	A	28-06-1994	US 5268862 A US 6608774 B1 US 6483735 B1	07-12-1993 19-08-2003 19-11-2002